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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/666,953	09/17/2003	Qinfang Sun	ATHEP124	7068

21912 7590 05/02/2007

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EXAMINER	
SAWHNEY, VAIBHAV	

ART UNIT	PAPER NUMBER
2616	

MAIL DATE	DELIVERY MODE
05/02/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/666,953	SUN ET AL.
	Examiner	Art Unit
	VAIBHAV (MANU) SAWHNEY	2616

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4-11 and 14-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4-11 and 14-26* is/are rejected.

7)☒ Claim(s) *3,12 and 13* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 September 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to because in Fig. 4, step 432, the comparison result output is both shown as "N", one of them should be a yes and therefore shown as "Y". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities: On page 8, line 17 shows "packets uses the slowest data rate in that class". It appears that it

actually should be "packets uses the fastest data rate in that class". Appropriate correction is required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 25 and 26 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. It is suggested that the claims should be stated as: "a computer readable medium having a stored computer program comprising..."

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 2, 21, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al. (6,707,856) in view of Arima et al. (2003/0165185).

As to claim 1, Gardner et al. show a method of receiving a plurality of training symbols (Col. 2, lines 41-51) sent for the purpose of facilitating channel estimation and calculating a phase difference between at least two of the training symbols (Col. 2, lines 41-51) comprising received signals that are broken down into first and second OFDM frequency domain bursts, further extracting a first set of training symbols from the first OFDM frequency domain burst and a second set of training symbols from the second OFDM frequency domain burst, that is, signals are received that are made of plurality of training and data symbols, and further obtaining (calculating) phase differences (by the differential decoder) between symbols of the second set of training symbols and the first set of training symbols (thus calculating phase differences between at least 2 training symbols), and finally determining communication configuration information (channel estimation) based on the phase differences (Col. 2, lines 41-51). Further more, Gardner et al. show a method where a converter that converts a received time domain signal into a series of OFDM frequency domain bursts, a selector that extracts training symbols from the series of OFDM frequency domain bursts, a channel estimation block that estimates channel response based on the training symbols (thus training symbols are sent for channel estimation purposes), and a control processor that determines system configuration based on the training symbols (Col. 2, line 67; Col. 3, lines 1-6).

However, Gardner et al. do not show using the calculated phase difference to coherently combine the training symbols to produce a composite training symbol and using the composite training symbol to estimate the channel.

Arima et al. show a method where using the calculated phase difference to coherently combine the training symbols to produce a composite training symbol and using the composite training symbol to estimate the channel comprising calculating an in-phase addition value for every plural pilot symbols (training symbols) by in-phase addition of pilot signals (phase information/phase difference is used to add plurality of pilot/training symbols) (Page 2, paragraph 0022; Figs. 1, 2, 6, and 7), and performing weighted addition using individually the amplitude components and phase components of the calculated in-phase addition values. Further, the amplitude components and phase components of respective channel estimates are calculated (channel is estimated) using this added pilot/training symbols (Page 2, paragraph 0022; Figs. 1, 2, 6, and 7). Further, Arima et al. show the plurality of pilot symbols in pilot block 11 that are in-phase-added (according to their phase information) and the channel estimate of the nth pilot block is calculated (Page 1, paragraph 0004). Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to better estimate the channel conditions and efficiently utilize network resources by effectively assigning the network resources to the channel based on the channel conditions.

As to claim 2, Gardner et al. show all the elements except explicitly the plurality of training symbols including more than two training symbols. Arima et al. show the plurality of training symbols including more than two training symbols comprising plurality of blocks of pilot signals (training) containing plurality of pilot symbols (training

symbols) (Fig. 1; Page 1, paragraph 0003). Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to better estimate the channel conditions and efficiently utilize network resources by effectively assigning the network resources to the channel based on the channel conditions.

As to claim 21, Gardner et al. show a system comprising a system of receiver (502 and 504; Fig. 5) receiving a plurality of training symbols sent for the purpose of facilitating channel estimation and calculating a phase difference between at least two of the training symbols comprising received signals that are broken down into first and second OFDM frequency domain bursts, further extracting a first set of training symbols from the first OFDM frequency domain burst and a second set of training symbols from the second OFDM frequency domain burst, that is, signals are received that are made of plurality of training and data symbols, and further obtaining (calculating/processing) phase differences (by the differential decoder that has a processor built in; 510; Fig. 5) between symbols of the second set of training symbols and the first set of training symbols (thus calculating phase differences between at least 2 training symbols), and finally determining communication configuration information (channel estimation) based on the phase differences (Col. 2, lines 41-51). Further more, Gardner et al. show a method where a converter that converts a received time domain signal into a series of OFDM frequency domain bursts, a selector that extracts training symbols from the series of OFDM frequency domain bursts, a channel estimation block that estimates

channel response based on the training symbols (thus training symbols are sent for channel estimation purposes), and a control processor that determines system configuration based on the training symbols (Col. 2, line 67; Col. 3, lines 1-6).

However, Gardner et al. do not show using the calculated phase difference to coherently combine the training symbols to produce a composite training symbol and using the composite training symbol to estimate the channel.

Arima et al. show a system where using the calculated phase difference to coherently combine the training symbols to produce a composite training symbol and using the composite training symbol to estimate the channel comprising calculating an in-phase addition value for every plural pilot symbols (training symbols) by in-phase addition of pilot signals (phase information/phase difference is used to add plurality of pilot/training symbols), and performing weighted addition using individually the amplitude components and phase components of the calculated in-phase addition values. Further, the amplitude components and phase components of respective channel estimates are calculated (channel is estimated) using this added pilot/training symbols (Page 2, paragraph 0022; Figs. 1, 2, 6, and 7; processor is part of 201 and 203 in Fig. 6). Further, Arima et al. show the plurality of pilot symbols in pilot block 11 that are in-phase-added (according to their phase information) and the channel estimate of the nth pilot block is calculated (Page 1, paragraph 0004). Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the system of Gardner et al. to better estimate the channel conditions and efficiently utilize

network resources by effectively assigning the network resources to the channel based on the channel conditions.

As to claim 25, Gardner et al. show a method of receiving a plurality of training symbols sent for the purpose of facilitating channel estimation and calculating a phase difference between at least two of the training symbols comprising received signals that are broken down into first and second OFDM frequency domain bursts, further extracting a first set of training symbols from the first OFDM frequency domain burst and a second set of training symbols from the second OFDM frequency domain burst, that is, signals are received that are made of plurality of training and data symbols, and further obtaining (calculating) phase differences (by the differential decoder) between symbols of the second set of training symbols and the first set of training symbols (thus calculating phase differences between at least 2 training symbols), and finally determining communication configuration information (channel estimation) based on the phase differences (Col. 2, lines 41-51). Further more, Gardner et al. show a method where a converter that converts a received time domain signal into a series of OFDM frequency domain bursts, a selector that extracts training symbols from the series of OFDM frequency domain bursts, a channel estimation block that estimates channel response based on the training symbols (thus training symbols are sent for channel estimation purposes), and a control processor that determines system configuration based on the training symbols (Col. 2, line 67; Col. 3, lines 1-6).

However, Gardner et al. do not show a computer program product using the calculated phase difference to coherently combine the training symbols to produce a composite training symbol and using the composite training symbol to estimate the channel.

Arima et al. show a computer program product comprising a base station (apparatus that contains computer program means, which has a transceiver in it) obtains a high-precision demodulated signal by providing a receiving apparatus whereby the amount of computation is suppressed, channel estimation precision is improved, and deterioration of information signal reception quality is reduced, even in a situation where frequency offset and fading are present, thus making it possible to perform good radio communications (Page 8, paragraph 0103). Arima et al. further show the product using the calculated phase difference to coherently combine the training symbols to produce a composite training symbol and using the composite training symbol to estimate the channel comprising calculating an in-phase addition value for every plural pilot symbols (training symbols) by in-phase addition of pilot signals (phase information/phase difference is used to add plurality of pilot/training symbols), and performing weighted addition using individually the amplitude components and phase components of the calculated in-phase addition values. Further, the amplitude components and phase components of respective channel estimates are calculated (channel is estimated) using this added pilot/training symbols (Page 2, paragraph 0022; Figs. 1, 2, 6, and 7). Further, Arima et al. show the plurality of pilot symbols in pilot block 11 that are in-phase-added (according to their phase information)

and the channel estimate of the nth pilot block is calculated (Page 1, paragraph 0004). Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the system of Gardner et al. to better estimate the channel conditions and efficiently utilize network resources by effectively assigning the network resources to the channel based on the channel conditions.

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al. (6,707,856) in view of Arima et al. (2003/0165185), further in view of Jones IV et al. (6,930,989).

As to claim 4, Gardner et al. and Arima et al. show all the elements except the calculated phase difference being used for fine frequency offset determination.

However, Jones IV et al. show the calculated phase difference being used for fine frequency offset determination comprising the determination of large frequency offset (comprising fine frequency offset) is dependent on synchronization information encoded in the phase relationships (interpreted as phase differences) between training symbols, that is, the phase differences between training symbols determine large (fine) frequency offset (Col. 6, lines 20-23). Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to and Arima et al. to better estimate the channel conditions and efficiently utilize network resources by effectively assigning the network resources to the channel based on the channel conditions.

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al. (6,707,856) in view of Arima et al. (2003/0165185), further in view of You et al. (2003/0112743).

As to claim 5, Gardner et al. and Arima et al. show all the elements except the training symbols being long symbols defined in the IEEE 802.11a standard.

However, You et al. show the training symbols being long symbols defined in the IEEE 802.11a standard comprising a physical layer convergence procedure (PLCP) preamble field 200 is used for synchronization. The preamble field 200 includes a field of ten short training symbols 201 and a field of two long training symbols 202 (Page 2, paragraph 0031; Fig. 2). Further, A standard for an OFDM-based WLAN system is specified in "Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications: High-speed physical layer for the 5 GHz band," IEEE std 802.11a, pp. 3-24, September 1999 (Page 2, paragraph 0030). Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to and Arima et al. to do a better precise frequency estimation by using long symbols.

7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al. (6,707,856) in view of Arima et al. (2003/0165185), further in view of Jones IV et al. (6,930,989), in further view of Seo et al. (EP1193934).

As to claim 6, Gardner et al. and Arima et al. show all the elements except a method wherein a plurality of phase differences are calculated and the average of the phase differences is used for fine frequency offset determination.

Jones IV et al. show the determination of large frequency offset (comprising fine frequency offset) is dependent on synchronization information encoded in the phase relationships (interpreted as phase differences) between training symbols, that is, the phase differences between training symbols determine large (fine) frequency offset (Col. 6, lines 20-23). Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to and Arima et al. to better estimate the channel conditions and efficiently utilize network resources by effectively assigning the network resources to the channel based on the channel conditions.

However, Jones IV et al. do not show the average of the phase differences being used.

Seo et al. show the average of the phase differences being used comprising a method of averaging the compensated phases and estimates the frequency offset (fine frequency offset) based on the average (Page 2, paragraph 0009). Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to and Arima et al. and Jones IV et al. to better estimate the channel conditions and efficiently utilize network resources by effectively assigning the network resources to the channel based on the channel conditions and thus properly synchronizing transmitters with the receivers.

8. Claims 7-10, 14-17, 20, 22-24, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al. (6,707,856) in view of Dolle et al. (6,674,817).

As to claim 7, Gardner et al. show receiving a plurality of training symbols sent for the purpose of facilitating channel estimation and detecting a phase transition between at least two of the training symbols comprising received signals that are broken down into first and second OFDM frequency domain bursts, further extracting a first set of training symbols from the first OFDM frequency domain burst and a second set of training symbols from the second OFDM frequency domain burst, that is, signals are received that are made of plurality of training and data symbols, and further obtaining (detecting) phase differences (phase transitions) between symbols of the second set of training symbols and the first set of training symbols (thus detecting phase transitions between at least 2 training symbols), and finally determining communication configuration information (channel estimation) based on the phase differences (Col. 2, lines 41-51). Further more, Gardner et al. show a method where a converter that converts a received time domain signal into a series of OFDM frequency domain bursts, a selector that extracts training symbols from the series of OFDM frequency domain bursts, a channel estimation block that estimates channel response based on the training symbols (thus training symbols are sent for channel estimation purposes), and a control processor that determines system configuration based on the training symbols (Col. 2, line 67; Col. 3, lines 1-6).

However, Gardner et al. do not show classifying the packet based on the detected phase transition. Dolle et al. show classifying the packet based on the detected phase transition comprising recognizing means (classifying means) for recognizing the type of a received data burst on the basis of a phase value of the auto-correlation result (phase difference result) of the training sequence (containing training symbols) of said burst (includes plurality of packets) (Col. 3, lines 8-10). Further, Dolle et al. show the phase information of the auto-correlation result for the two training sequences is different so that the different types of data bursts can be distinguished (classified) (Col. 4, lines 5-8).

Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to distinguish or classify the incoming packets to provide quality of service and also to estimate the channel, thus to avoid wasting network resources.

As to claim 8, Gardner et al. show all the elements except specifically detecting a phase transition between at least two of the training symbols that includes calculating a phase difference between at least two of training symbols and comparing the calculated phase difference to a threshold.

Dolle et al. show detecting a phase transition between at least two of the training symbols that includes calculating a phase difference between at least two of training symbols and comparing the calculated phase difference to a threshold comprising the recognizing means of the communication device that includes the means for detecting

the phase of the auto-correlation result of the training sequence (plurality of symbols; Fig. 3). In this case, the recognizing means can further comprise means for comparing the detected phase (calculated phase difference) with a predetermined phase threshold to recognize the type of the received data burst (Col. 4, lines 41-47).

Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to calculate an accurate value of the frequency offset of the transmitted data bursts.

As to claim 9, Gardner et al. show all the elements except a method of detecting a phase transition between at least two of the training symbols includes conjugate multiplying the training symbols and determining the sign of the real part of the result of the conjugate multiplying.

Dolle et al. show a method of detecting a phase transition between at least two of the training symbols includes conjugate multiplying the training symbols and determining the sign of the real part of the result of the conjugate multiplying comprising a training sequence consists of a predetermined number of repetition patterns or symbols, whereby each symbol consists of a certain number of samples. Further, in the correlation means 5, the samples (training symbols) are supplied to a delay means 8 for delaying the samples by a factor D.sub.ac and supplied to a means 9 for calculating the conjugate complex value of the data. The conjugate complex data samples output from the means 9 are multiplied with the received data samples in a multiplier 12. If e.g. the delay means 8 delays the received data by one sample, so that the conjugate complex

value of each preceding sample is multiplied with the succeeding sample in the multiplier 12 (Col. 7, lines 52-57; Fig. 4).

Further, Dolle et al. show the recognizing means advantageously comprises means for detecting the sign value of the real part (sign of the real part) of the auto-correlation result (result of the conjugate multiplying) of the training sequence and means for determining the type of the received data burst on the basis of said sign value.

Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to detect the incoming packets as within the parameters/threshold values, thus to provide proper synchronization between the receiver and transmitter.

As to claim 10, Gardner et al. show all the elements except a method of detecting a phase transition between at least two of the training symbols includes computing the angle of the self correlation of the training symbols.

However, Dolle et al. show a method of detecting a phase transition between at least two of the training symbols includes computing the angle of the self correlation of the training symbols comprising the detecting means 19 can calculate the angle of the auto-correlation (self correlation) result and then calculate the phase value from the calculated angle (Col. 9, lines 52-54).

Therefore, it would have been obvious to on of ordinary skilled in the art at the

time of invention to modify the method of Gardner et al. to be able to accurately synchronize the receiver with the transmitter.

As to claim 14, Gardner show all the elements except a method wherein the phase difference is caused by inverting the sign of a selected training symbol.

Dolle et al. show a method wherein the phase difference is caused by inverting the sign of a selected training symbol comprising by inverting the symbols of the second training sequence in this way, a different phase behaviour (phase difference) for the first and second training sequence (symbols) can be obtained in the auto-correlation procedure performed in the recognizing means 7, so that first and second training sequences and therefore first type and second type data bursts can be distinguished from each other (Col. 7, lines 10-16). Therefore, it would have been obvious to one of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to be able to provide synchronization between the receiver and transmitter.

As to claim 15, Gardner et al. show all the elements except a method wherein the phase difference is caused by inverting the sign of a selected training symbol and the classification is based on which training symbol was selected to be inverted.

Dolle et al. show a method wherein the phase difference is caused by inverting the sign of a selected training symbol and the classification is based on which training symbol was selected to be inverted comprising by inverting the symbols of the second training sequence in this way, a different phase behaviour (phase difference) for the first

and second training sequence (symbols) can be obtained in the auto-correlation procedure performed in the recognizing means 7, so that first and second training sequences and therefore first type and second type data bursts can be distinguished from each other (classified) (Col. 7, lines 10-16). Therefore, it would have been obvious to one of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to be able to provide synchronization between the receiver and transmitter.

As to claim 16, Gardner et al. show all the elements except a method wherein the result of comparing the calculated phase difference to a threshold is used as a confirmation that the packet is a valid packet.

Dolle et al. show a method wherein the result of comparing the calculated phase difference to a threshold is used as a confirmation that the packet is a valid packet comprising by inverting the symbols of the second training sequence in this way, a different phase behaviour (phase difference) for the first and second training sequence (symbols) can be obtained in the auto-correlation procedure performed in the recognizing means 7, so that first and second training sequences and therefore first type and second type data bursts can be distinguished from each other (interpreted as determining whether packets are valid or invalid) (Col. 7, lines 10-16). Therefore, it would have been obvious to one of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to be able to provide synchronization between the

receiver and transmitter.

As to claim 17, Garner show all the elements except a method wherein the result of comparing the calculated phase difference to a threshold is used to selectively change the polarity one or more received training symbols.

Dolle et al. show a method wherein the result of comparing the calculated phase difference to a threshold is used to selectively change the polarity one or more received training symbols comprising the recognizing means of the communication device that includes the means for detecting the phase of the auto-correlation result of the training sequence (symbols). Dolle et al. further show the recognizing means can further comprise means for comparing the detected phase (calculated phase difference) with a predetermined phase threshold to recognize the type of the received data burst (Col. 4, lines 41-47). Further, the recognizing means advantageously comprises means for detecting the sign value of the real part of the auto-correlation result of the training sequence. Thus, inverting the symbols (changing the polarity) of the second training sequence (containing plurality of symbols) in this way is done, that is by using the auto-correlation result, and further a (new) different phase behaviour (phase difference) for the first and second training sequence (symbols) can be obtained in the auto-correlation procedure performed in the recognizing means 7, so that first and second training sequences and therefore first type and second type data bursts can be distinguished from each other (Col. 7, lines 10-16). Therefore, it would have been obvious to one of

ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to be able to provide proper synchronization between the receiver and transmitter.

As to claim 20, Gardner et al. show a method of receiving a plurality of training symbols sent for the purpose of facilitating channel estimation and calculating a phase difference between at least two of the training symbols comprising received signals that are broken down into first and second OFDM frequency domain bursts, further extracting a first set of training symbols from the first OFDM frequency domain burst and a second set of training symbols from the second OFDM frequency domain burst, that is, signals are received that are made of plurality of training and data symbols, and further obtaining (calculating) phase differences (by the differential decoder) between symbols of the second set of training symbols and the first set of training symbols (thus calculating phase differences between at least 2 training symbols), and finally determining communication configuration information (channel estimation) based on the phase differences (Col. 2, lines 41-51). Further more, Gardner et al. show a method where a converter that converts a received time domain signal into a series of OFDM frequency domain bursts, a selector that extracts training symbols from the series of OFDM frequency domain bursts, a channel estimation block that estimates channel response based on the training symbols (thus training symbols are sent for channel estimation purposes), and a control processor that determines system configuration based on the training symbols (Col. 2, line 67; Col. 3, lines 1-6).

Gardner et al. do not show a method of using the calculated phase difference to determine a fine frequency offset.

Doll et al. show a method of using the calculated phase difference to determine a fine frequency offset comprising the means for detecting the phase of the auto-correlation result of the training sequence. In this case, the recognizing means can further comprise means for comparing the detected phase with a predetermined phase threshold to recognize the type of the received data burst. This first alternative enables a very accurate phase determination, which can be further used for the calculation of an accurate value of the frequency offset of the transmitted data bursts (Col. 4, lines 41-50). Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to provide proper synchronization between various transmitters and receivers.

As to claim 22, Gardner et al. show a system comprising a system of receiver (502 and 504; Fig. 5) receiving a plurality of training symbols sent for the purpose of facilitating channel estimation and calculating a phase difference between at least two of the training symbols comprising received signals that are broken down into first and second OFDM frequency domain bursts, further extracting a first set of training symbols from the first OFDM frequency domain burst and a second set of training symbols from the second OFDM frequency domain burst, that is, signals are received that are made of plurality of training and data symbols, and further obtaining (calculating/processing) phase differences (by the differential decoder that has a processor built in; 510; Fig. 5)

between symbols of the second set of training symbols and the first set of training symbols (thus calculating phase differences between at least 2 training symbols), and finally determining communication configuration information (channel estimation) based on the phase differences (Col. 2, lines 41-51). Further more, Gardner et al. show a system where a converter that converts a received time domain signal into a series of OFDM frequency domain bursts, a selector that extracts training symbols from the series of OFDM frequency domain bursts, a channel estimation block that estimates channel response based on the training symbols (thus training symbols are sent for channel estimation purposes), and a control processor that determines system configuration based on the training symbols (Col. 2, line 67; Col. 3, lines 1-6).

However, Gardner et al. do not show a processor for classifying the packet based on the detected phase transition.

Dolle et al. show a processor for classifying the packet based on the detected phase transition comprising a recognizer (processor, 7, Fig. 2) (classifying means) for recognizing the type of a received data burst on the basis of a phase value of the auto-correlation result (phase difference result) of the training sequence (containing training symbols) of said burst (includes plurality of packets) (Col. 3, lines 8-10). Further, Dolle et al. show the phase information of the auto-correlation result for the two training sequences is different so that the different types of data bursts can be distinguished (classified) (Col. 4, lines 5-8).

Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the system of Gardner et al. to distinguish or classify the

incoming packets to provide quality of service and also to estimate the channel, thus to avoid wasting network resources.

As to claim 23, Gardner et al. show a system using a transmitter configured to transmit a plurality of training symbols sent for the purpose of facilitating channel estimation comprising a system of transmitter (422 and 424; Fig. 4) for transmitting apparatus for use in a digital communication system employing orthogonal frequency division multiplexing. The apparatus transmits configuration information from a first node to a second node. The apparatus includes a burst formation system that forms a frequency domain burst. The burst includes data symbols and training symbols. The training symbols also encode configuration information. The burst also includes a transform block that converts the frequency domain burst into a time domain burst for transmission from the first node to the second node (Col. 2, lines 52-62). Furthermore, Gardner et al. show a system where a converter that converts a received time domain signal into a series of OFDM frequency domain bursts, a selector that extracts training symbols from the series of OFDM frequency domain bursts, a channel estimation block that estimates channel response based on the training symbols (thus training symbols are sent for channel estimation purposes), and a control processor that determines system configuration based on the training symbols (Col. 2, line 67; Col. 3, lines 1-6).

However, Gardner et al. do not show a processor configured to invert the sign of one or more training symbols according to the classification of 20 the packet.

Dolle et al. show a processor configured to invert the sign of one or more training symbols according to the classification of 20 the packet comprising a sign detector (17; Fig. 7; processor) where the phase difference is caused by inverting the sign of a selected training symbol comprising by inverting the symbols of the second training sequence in this way, thus a different phase behaviour (phase difference) for the first and second training sequence (symbols) can be obtained in the auto-correlation procedure performed in the recognizing means 7, so that first and second training sequences and therefore first type and second type data bursts can be distinguished from each other (Col. 7, lines 10-16). Therefore, it would have been obvious to one of ordinary skilled in the art at the time of invention to modify the system of Gardner et al. to be able to provide synchronization between the receiver and transmitter.

As to claim 24, Gardner et al. show a system comprising a system of receiver (502 and 504; Fig. 5) receiving a plurality of training symbols sent for the purpose of facilitating channel estimation and calculating a phase difference between at least two of the training symbols comprising received signals that are broken down into first and second OFDM frequency domain bursts, further extracting a first set of training symbols from the first OFDM frequency domain burst and a second set of training symbols from the second OFDM frequency domain burst, that is, signals are received that are made of plurality of training and data symbols, and further obtaining (calculating/processing) phase differences (by the differential decoder that has a processor built in; 510; Fig. 5) between symbols of the second set of training symbols and the first set of training

symbols (thus calculating phase differences between at least 2 training symbols), and finally determining communication configuration information (channel estimation) based on the phase differences (Col. 2, lines 41-51). Further more, Gardner et al. show a system where a converter that converts a received time domain signal into a series of OFDM frequency domain bursts, a selector that extracts training symbols from the series of OFDM frequency domain bursts, a channel estimation block that estimates channel response based on the training symbols (thus training symbols are sent for channel estimation purposes), and a control processor that determines system configuration based on the training symbols (Col. 2, line 67; Col. 3, lines 1-6).

Gardner et al. do not show a system of using processor to use the calculated phase difference to determine a fine frequency offset.

Doll et al. show a system of using a processor the calculated phase difference to determine a fine frequency offset comprising a processor (Fig. 7) that has the means for detecting the phase of the auto-correlation result of the training sequence. In this case, the recognizing means can further comprise means for comparing the detected phase with a predetermined phase threshold to recognize the type of the received data burst. This first alternative enables a very accurate phase determination, which can be further used for the calculation of an accurate value of the frequency offset of the transmitted data bursts (Col. 4, lines 41-50). Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the system of Gardner et al. to provide proper synchronization between various transmitters and receivers.

As to claim 26, Gardner et al. show a system of receiving a plurality of training symbols sent for the purpose of facilitating channel estimation and calculating a phase difference between at least two of the training symbols comprising received signals that are broken down into first and second OFDM frequency domain bursts, further extracting a first set of training symbols from the first OFDM frequency domain burst and a second set of training symbols from the second OFDM frequency domain burst, that is, signals are received that are made of plurality of training and data symbols, and further obtaining (calculating) phase differences (by the differential decoder) between symbols of the second set of training symbols and the first set of training symbols (thus calculating phase differences between at least 2 training symbols), and finally determining communication configuration information (channel estimation) based on the phase differences (Col. 2, lines 41-51). Further more, Gardner et al. show a method where a converter that converts a received time domain signal into a series of OFDM frequency domain bursts, a selector that extracts training symbols from the series of OFDM frequency domain bursts, a channel estimation block that estimates channel response based on the training symbols (thus training symbols are sent for channel estimation purposes), and a control processor that determines system configuration based on the training symbols (Col. 2, line 67; Col. 3, lines 1-6).

However, Gardner et al. do not show a computer program product comparing the calculated phase difference to a threshold and classifying the packet based on the comparison.

Dolle et al. show a computer program product (base station comprising computer program means) (Col. 1, line 17) that is used for transmitting and receiving information. Further, Dolle et al. show detecting a phase transition between at least two of the training symbols that includes calculating a phase difference between at least two of training symbols and comparing the calculated phase difference to a threshold comprising the recognizing means of the communication device that includes the means for detecting the phase of the auto-correlation result of the training sequence (plurality of symbols; Fig. 3). In this case, the recognizing means can further comprise means for comparing the detected phase (calculated phase difference) with a predetermined phase threshold to recognize the type of the received data burst (Col. 4, lines 41-47).

Also, Dolle et al. show classifying the packet based on the detected phase transition comprising recognizing means (classifying means) for recognizing the type of a received data burst on the basis of a phase value of the auto-correlation result (phase difference result) of the training sequence (containing training symbols) of said burst (includes plurality of packets) (Col. 3, lines 8-10). Further, Dolle et al. show the phase information of the auto-correlation result for the two training sequences is different so that the different types of data bursts can be distinguished (classified) (Col. 4, lines 5-8). Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to distinguish or classify the incoming packets to provide quality of service and also to estimate the channel, thus to avoid wasting network resources.

9. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al. (6,707,856) in view of Dolle et al. (6,674,817), further in view of Buehrer et al. (6,515,978).

As to claim 11, Gardner et al. show all the elements except a method wherein the classification determines the number of training symbols expected.

Dolle et al. show the classification method comprising comprising recognizing means (classifying means) for recognizing the type of a received data burst on the basis of a phase value of the auto-correlation result (phase difference result) of the training sequence (containing training symbols) of said burst (includes plurality of packets) (Col. 3, lines 8-10). Further, Dolle et al. show the phase information of the auto-correlation result for the two training sequences is different so that the different types of data bursts can be distinguished (classified) (Col. 4, lines 5-8). Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to classify the incoming packets to provide quality of service later on.

However, Dolle et al. do not show determining the number of training symbols expected. Buehrer et al. show determining the number of training symbols expected comprising the number and frequency of the training symbols being determined by the SNR (signal-to-noise ratio) required in the channel estimate (Col. 9 lines 5-8). Therefore, it would have been obvious to one of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. and Dolle et al. to improve the channel

estimate by increasing the number of training symbols since the effect of noise can be averaged out on each individual sample.

10. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gardner et al. (6,707,856) in view of Dolle et al. (6,674,817), further in view of Arima et al. (2003/0165185).

As to claim 18, Garner show all the elements except a method wherein the result of comparing the calculated phase difference to a threshold is used to selectively change the polarity one or more received training symbols and wherein the calculated phase difference used to coherently combine the training symbols.

Dolle et al. show a method wherein the result of comparing the calculated phase difference to a threshold is used to selectively change the polarity one or more received training symbols comprising the recognizing means of the communication device that includes the means for detecting the phase of the auto-correlation result of the training sequence (symbols). Dolle et al. further show the recognizing means can further comprise means for comparing the detected phase (calculated phase difference) with a predetermined phase threshold to recognize the type of the received data burst (Col. 4, lines 41-47). Further, the recognizing means advantageously comprises means for detecting the sign value of the real part of the auto-correlation result of the training sequence. Thus, inverting the symbols (changing the polarity) of the second training sequence (containing plurality of symbols) in this way is done, that is by using the auto-correlation result, and further a (new) different phase behaviour (phase difference) for

the first and second training sequence (symbols) can be obtained in the auto-correlation procedure performed in the recognizing means 7, so that first and second training sequences and therefore first type and second type data bursts can be distinguished from each other (Col. 7, lines 10-16). Therefore, it would have been obvious to one of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. to be able to provide proper synchronization between the receiver and transmitter.

Arima et al. show a method wherein the calculated phase difference used to coherently combine the training symbols comprising calculating an in-phase addition value for every plural pilot symbols (training symbols) by in-phase addition of pilot signals (phase information/phase difference is used to add plurality of pilot/training symbols), and performing weighted addition using individually the amplitude components and phase components of the calculated in-phase addition values. Further, the amplitude components and phase components of respective channel estimates are calculated (channel is estimated) using this added pilot/training symbols (Page 2, paragraph 0022; Figs. 1, 2, 6, and 7). Further, Arima et al. show the plurality of pilot symbols in pilot block 11 that are in-phase-added (according to their phase information) and the channel estimate of the nth pilot block is calculated (Page 1, paragraph 0004). Therefore, it would have been obvious to on of ordinary skilled in the art at the time of invention to modify the method of Gardner et al. and Dolle et al. to better estimate the channel conditions and efficiently utilize network resources by effectively assigning the network resources to the channel based on the channel conditions.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

12. Claims 19 are rejected under 35 U.S.C. 102(e) as being unpatentable by Dolle et al. (6,674,817).

As to claim 19, Dolle et al. show a method of determining the classification of the packet, selectively inverting the sign of one or more training symbols according to the classification of the packet, and transmitting the plurality of training symbols comprising the recognizing means (classifying means) for recognizing the type of a received data burst on the basis of a phase value of the auto-correlation result (phase difference result) of the training sequence (containing training symbols) of said burst (includes plurality of packets) (Col. 3, lines 8-10). Further, Dolle et al. show the phase information of the auto-correlation result for the two training sequences is different so that the different types of data bursts can be distinguished (classified) (Col. 4, lines 5-8).

Further, Dolle et al. show the second training sequence (containing plurality of training symbols) can, but does not need to have the same length or number of (Col. 6,

lines 66-67) symbols as the first training sequence and the same duration or number of samples within the symbols as the first training sequence. The content, that is, the absolute values of the symbols of the first and the second training sequence are identical, whereby every symbol of the second training sequence is inverted in relation to the preceding symbol, which means that every first, second, third etc. sample of the one symbol is the negative value of the respective first, second, third etc. sample of the preceding symbol. The symbols of the first training sequence are not inverted in relation to each other. By inverting the symbols of the second training sequence in this way, a different phase behaviour for the first and second training sequence can be obtained in the auto-correlation procedure performed in the recognizing means 7, so that first and second training sequences and therefore first type and second type data bursts can be distinguished from each other (Col. 7, lines 1-16).

Finally, Dolle et al. show transmitting the plurality of training symbols comprising data bursts of a first type (containing first training sequence that further contains training symbols) transmitted from a first communication device (Col. 1, lines 13-14).

Allowable Subject Matter

13. **Claims 3, 12, and 13 objected to** as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Any inquiry concerning this communication or earlier communications from the examiner should be directed to VAIBHAV (MANU) SAWHNEY whose telephone number is 571-272-9738. The examiner can normally be reached on Monday - Friday 07:30AM - 1700 EST, alt. fri. off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, KWANG B. YAO can be reached on 571-272-3182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KWANG BIN YAO
SUPERVISORY PATENT EXAMINER

Vaibhav S.

VAIBHAV (MANU) SAWHNEY